# ENERGY SAVINGS OPPORTUNITY SURVEY
# FORT LESLIE J. MCNAIR, WASHINGTON, D.C.

**A/E CONTRACT NO.**
**DACA 31-89-C-0198**

**FINAL SUBMITTAL**

## VOLUME I
## EXECUTIVE SUMMARY



**Prepared for**

**DEPARTMENT OF THE ARMY**
**BALTIMORE DISTRICT CORPS OF ENGINEERS**
**BALTIMORE, MARYLAND**

**By**

**ENGINEERING APPLICATIONS CONSULTANTS, P.C.**
**9004-B CROWNWOOD COURT**
**BURKE, VIRGINIA 22015-1630**
**July 1991**

DEPARTMENT OF THE ARMY
CONSTRUCTION ENGINEERING RESEARCH LABORATORIES, CORPS OF ENGINEERS
P.O. BOX 9005
CHAMPAIGN, ILLINOIS 61826-9005

REPLY TO
ATTENTION OF: TR-I Library

17 Sep 1997

Based on SOW, these Energy Studies are unclassified/unlimited.
Distribution A. Approved for public release.

Marie Wakefield,
Librarian Engineering

VOLUME I

EXECUTIVE SUMMARY

## 1.0 INTRODUCTION

Fort McNair is a permanent United States Army installation located in southwest Washington, D.C. along the Washington Channel. It is the headquarters of the Military District of Washington as well as the National War College and Industrial College of the Armed Forces which form the National Defense University. The facility also contains family housing, barracks, a PX and a commissary.

The energy Savings Opportunity Survey (ESOS) for Fort McNair is a project to improve energy efficiency of the buildings by analyzing selected energy conservation opportunities (ECOs) indicated in the scope of work and making recommendations for any other ECO which may be applicable.

This project is funded under the National Energy Conservation Policy Act (NECPA). ESOS projects have the prime objective of evaluating energy conservation opportunities (ECOs) in quest of meeting the goals of the NECPA, the Army Energy Plan and the Department of Defense Energy Management Plan.

This study constitutes a pre-final submittal and includes the project criteria and the methodology used for conducting this analysis. The study also includes an ECIP analysis summary for each building.

Engineering services for this project are being provided by Engineering Applications Consultants, P.C. under Contract No. DACA 31-89-C-0198 for the Department of the Army, Baltimore District Corps of Engineers.

Significant assistance and cooperation has been provided by the Corps of Engineers and the user agency for this analysis. EAC wishes to extend special appreciation to Mrs. Joan A. Johnson, Mr. Ralph W. Gibson, Mr. Richard B. Rice and Mr. Hal C. Schramm for their assistance, and to Mr. James Hawk for his guidance, which has contributed to the development of this study.

## 2.0 PROJECT SUMMARY AND RECOMMENDATIONS

This study contains the findings of the Energy Savings Opportunity Survey at Fort McNair, Washington, D.C., and is based on the field survey, discussions with the users and the operating personnel and the review of drawings whenever available. Volume I of this study contains an executive summary, Volume II contains the project criteria, methodology and building narrative. Volume III containsthe programming documents. Volumes IV through VII contain calculations for all the ECOs considered.

Project criteria lists environmental conditions within the buildings and climatic data applicable to the project site. Included under project criteria are fuel rates, incentives offered by the Potomac Electric Power Company for implementing energy conservation opportunities, economic life of the improvements and discount factors.

The methodology section of this study contains a description of energy saving opportunities considered under this survey and the procedures for calculating the energy savings. The recommended ECOs have been prioritized by taking synergism into account.

An Energy Savings Opportunity Survey was conducted for building numbers 20, 31, 32, 35, 39, 40, 42, 45, 46, 47, 48, 49, 50, 52, 54, 56, 59, 60, and 61. In all buildings, except Building 20, ECO's pertaining to lighting were considered. The lighting ECOs have generally been categorized into two options. Option 1 contains an evaluation of lighting ECOs with standard forty watt lamps. Option 2 contains an evaluation of lighting ECO's with 34 watt energy saver lamps. The use of dimming devices reduces the fixture life. Therefore, ECOs for dimming have not been considered in Option 2. The inclusion of two options in this study will allow the post maximum flexibility for selecting these ECOs for packaging and their subsequent implementation.

The cost of lighting ECOs includes the incentives offered by PEPCO. The post should apply for these incentives immediately. Upon acceptance of the application, PEPCO will allocate funds for their implementation. This process, however, will not obligate the post to participate in the incentive program.

In calculating the cost of ECOs, cost of design has not been included. These ECO's can be implemented by the maintenance staff at the post. If the post decides the work to be done by a contractor, design cost should be included. The following is a summary of ECO's recommended for implementation. The programming documents for each option are included in Volume III.

## OPTION 1

| ECO DESCRIPTION | BUILDING NO. | COST FY 1991 | Quantity |
|---|---|---|---|
| Replace incandescent lamps w/fluorescent | 31, 32, 35, 39, 40, 42, 45, 46, 47, 48, 49, 50, 52, 54, 56, 59, 60, and 61 | $ 9,054 | 516 |
| Static Dimmers | 31, 32, 35, 39, 40, 42, 46, 47, 48, 50, 52, 54, 56, 59, 60, and 61 | $ 32,494 | 37 |
| Photo-Electric Dimmers | 31, 32, 47, 48, 49 and 50 | $ 3,682 | 200 |
| Fixture Reflectors | 32, 35, 39, 40, 42, 45, 46, 47, 48, 56, and 59 | $ 19,001 | 221 |

| | | | |
|---|---|---|---|
| Occupancy Sensors | 31, 32, 35, 39, 40, 42, 46, 47, 48, 49 50, 52, 60, 59 and 61 | $ 24,574 | 658 |
| Energy-Efficient Ballasts (Spot Replacement) | 31, 32, 35, 39, 40, 42, 45, 46, 47, 48, 49, 50, 52, 54, 56, 59, 60, and 61 | $115,321 | 6818 |
| Roof Insulation | 42 | $ 4,599 | - |
| Night Setback | 48 | $ 15,687 | - |
| Steam Convertor Insulation | 59 | $ 570 | - |
| TOTAL | | $224,982 | - |

## OPTION 2

| ECO DESCRIPTION | BUILDING NO. | COST FY 1991 | Quantity |
|---|---|---|---|
| Replace incandescent lamps w/fluorescent | 31, 32, 35, 39, 40, 42, 45, 46, 47, 48, 49, 50, 52, 54, 56, 59, 60, and 61 | $ 9,054 | 658 |
| Energy Saver Lamps | 31, 32, 35, 39, 40, 42, 45, 46, 47, 48, 49, 50, 52, 54, 56, 59, 60, and 61 | $ 86,609 | 11,737 |
| Fixture Reflectors | 32, 35, 39, 40, 42, 45, 46, 47, 48, 49, 56, and 59 | $ 21,580 | 251 |
| Occupancy Sensors | 31, 32, 35, 39, 40, 42, 46, 47, 48, 49 52, 59, 60, and 61 | $ 24,699 | 201 |
| Energy-Efficient Ballasts (Group Replacement) | 31, 32, 35, 39, 40, 42, 45, 46, 47, 48, 49, 50, 52, 54, 56, 59, 60, and 61 | $328,895 | 6,818 |

| | | | |
|---|---|---|---|
| **Roof Insulation** | **42** | **$ 4,599** | - |
| **Night Setback** | **48** | **$ 15,687** | - |
| **Steam Convertor Insulation** | **59** | **$ 570** | - |
| **TOTAL** | | **$491,693** | - |

Other lighting ECOs considered are replacing Mercury Vapor fixtures with Metal Halide fixtures and replacing fluorescent U-shaped lamps with energy efficient U-shaped lamps but are not recommended for implementation due to low SIR.

Building 20 currently has one #2 fuel oil boiler. An evaluation was made for conversion to natural gas. Because of low fuel oil cost and near replacement age of the boiler, the ECO is not feasible. The analysis shows a SIR of less than one for this conversion and is not recommended for implementation.

In building 42, energy usage was modeled by computer simulation. The building currently uses 117,949 btu/sq ft/yr. This energy consumption compares well with other federal buildings of similar size. In addition to the lighting ECO's listed above, the effectiveness of improving the roof insulation, solar film and chilled water reset were also considered. All ECO's except solar film and chilled water reset are being recommended for implementation. The night setback system associated with Building 42 offers a good potential for saving energy. This system is not in operation currently. A computer simulation shows that if this system were set in proper operation, it would result in energy savings of approximately 46,450 btu/sq ft/yr, resulting in a marked improvement in energy consumption.

In Buildings 42, 48, 59, and 61 steam systems were also surveyed. Usage of low pressure steam, regular program of trap repair, as well as the practice of cutting off the steam supply to these buildings during moderate weather, makes these systems quite efficient. The condition of the steam systems and maintenance are good. Repairing and setting the existing

indoor-outdoor reset systems in operation as part of the maintenance program is one of the recommendations.

Building 48 has been studied for its hydronic heat pump system. A computer simulation of this building calculated a total energy consumption of 64,468 but/sq ft/yr, indicating a very energy efficient building. The energy consumption can further be reduced by installing time clocks and occupancy sensors for night setback and set up. Occupancy sensors, however, have a very low SIR of 0.37.

Thermal Energy Storage (TES) was considered for Buildings 59 and 61. In Building 59 TES has a payback of 31 years and a negative payback in Building 61. This can be explained due to the fact that the existing chillers were installed approximately five years ago and are extremely energy efficient. The conversion of these chillers into thermal storage mode substantially increases kilowatts required per ton of cooling. Based on this analysis, it can be concluded that thermal storage is cost effective in new buildings or when the HVAC system in existing buildings is at the end of its useful life requiring replacement. In new buildings and during a complete retrofit of existing buildings, cost benefits result by downsizing the refrigeration plant and by downsizing the air distribution system by supplying cooler air. In these instances, the downsizing of the air conditioning equipment coupled with reduced demand charges may make the payback for thermal storage system attractive. In addition, diesel generators were also considered for peak shaving and load curtailment in both these buildings. Both approaches did not prove cost effective. It can be concluded that only existing building generators can be effective if retrofitted to be used for peak shaving or emergency back-up power.

## 3.0 BUILDINGS' DESCRIPTION

The scope of work of this Energy Savings Opportunity Survey includes the following buildings:

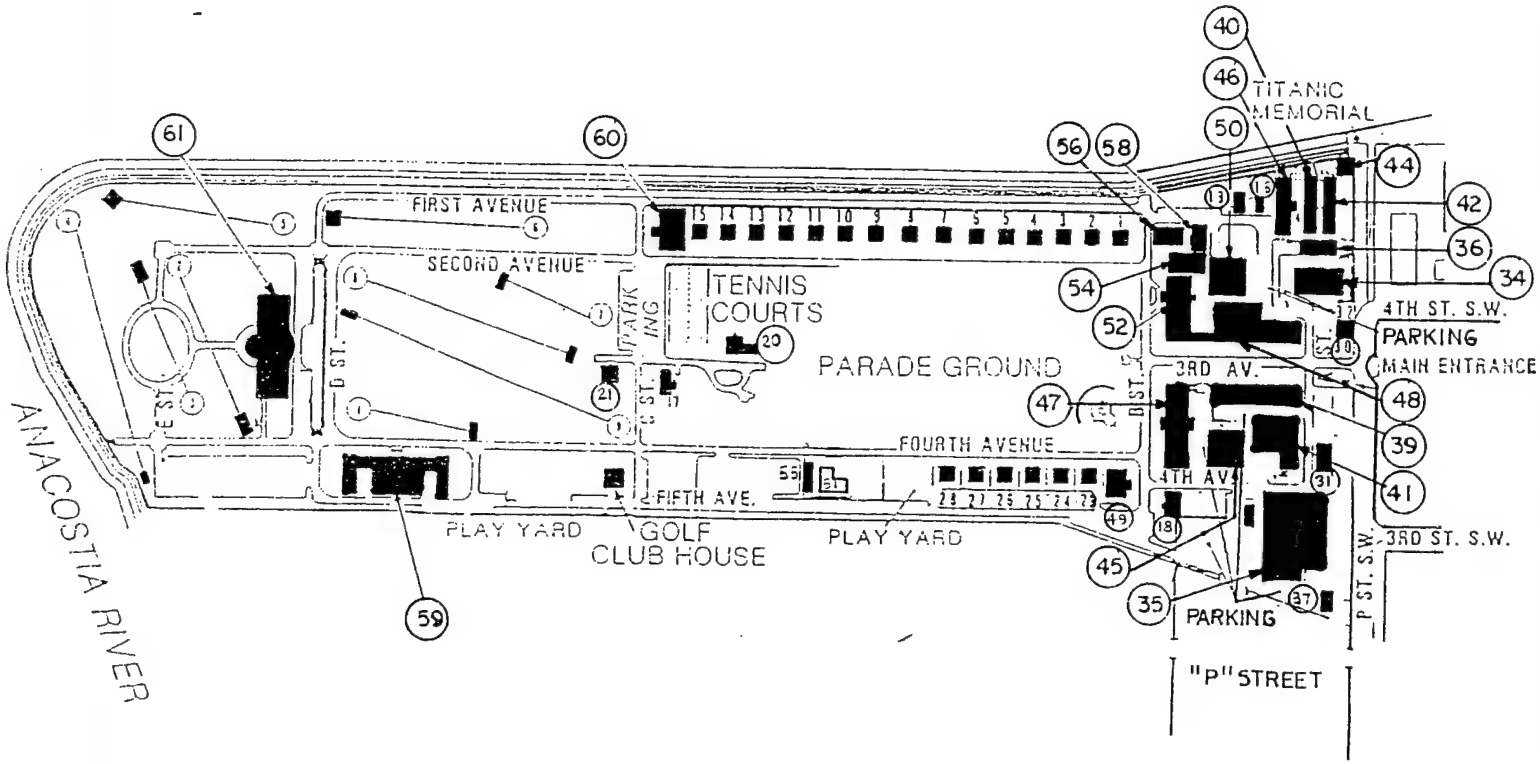
20, 31, 32, 35, 39, 40, 42, 45, 46
47, 48, 49, 50, 52, 54, 56, 59, 60, and 61

All the buildings are of brick masonry construction. They range in area from approximately 6,000 square feet in Building 40 to about 144,000 square feet each in Building 59 and 61. Building 61 was built in 1905 as the National War College. The buildings' usage includes, but is not limited to, office areas, storage areas, recreational and physical fitness facilities, NCO and officer clubs, dormitories, dining facilities and a chapel. Buildings 59 and 61, which together account for almost 50% of the office space at the base, house the units of the National Defense University and have office areas, classroom areas, student rooms and auditoriums. A site plan showing the location of these buildings is shown on the next page.

Most of the buildings are cooled and heated, except Building 49 which has a gymnasium and has heating only. Cooling requirements are met in most cases by air-cooled chillers or by DX-split systems. Building 59 has induction units along the perimeter walls, served by an air-handling unit in the penthouse. The air handling unit has chilled water and hot water coils. Heating is almost entirely by steam from the central plant, either directly or through steam to hot water converters in all buildings. Building 48, with office areas and downstairs, has a water-based heat pump system with a water-cooled chiller as the cooling source and a converter as the heating source. Console type heat pump units are located in spaces around the building.

Lighting in all buildings is almost universally by fluorescent fixtures.

# FORT LESLEY J. McNAIR
## WASHINGTON D.C.




| | | |
|---|---|---|
| Bldg. 20 | 18,000 Sq Ft | Apartments |
| Bldg. 31 | 7,000 Sq Ft | Offices and Dormitory |
| Bldg. 32 | 20,000 Sq Ft | Offices |
| Bldg. 35 | 45,000 Sq Ft | Commissary and Theatre |
| Bldg. 39 | 41,000 Sq Ft | Credit Union, Exchange and Information Center |
| Bldg. 40 | 6,000 Sq Ft | Offices and Shop |
| Bldg. 42 | 12,000 Sq Ft | Offices |
| Bldg. 45 | 19,000 Sq Ft | NCO Club and Craft Shop |
| Bldg. 46 | 12,000 Sq Ft | Offices |
| Bldg. 47 | 55,000 Sq Ft | Chapel and Infantry Company |
| Bldg. 48 | 50,000 Sq Ft | Offices and Dormitory |
| Bldg. 49 | 9,000 Sq Ft | Gymasium |
| Bldg. 50 | 17,000 Sq Ft | Dining Facility |
| Bldg. 52 | 35,000 Sq Ft | Offices and Classrooms |
| Bldg. 54 | 17,000 Sq Ft | Officer's Quarters |
| Bldg. 56 | 1,300 Sq Ft | Dental Clinic |
| Bldg. 59 | 144,000 Sq Ft | Offices, Auditorium, Cafeteria |
| Bldg. 60 | 20,000 Sq Ft | Officer's Club |
| Bldg. 61 | 144,000 Sq Ft | Defense University |

## 4.0 PRESENT ENERGY CONSUMPTION

### 4.1 Annual Energy Used

An analysis for an energy conservation project requires determination of existing energy-usage pattern. However, in the absence of any individual metering and due to a limited scope of the project the following baseline energy consumption has been established **only for the affected systems** in the respective buildings.

| | ENERGY USAGE (MBTU/YEAR) | | |
|---|---|---|---|
| BUILDING | LIGHTING SYSTEM | HVAC SYSTEM | TOTAL |
| 20 | - | 839.0 | 839.0 |
| 31 | 58.6 | - | 58.6 |
| 32 | 482.5 | - | 482.5 |
| 35 | 935.2 | - | 935.2 |
| 39 | 874.2 | - | 874.2 |
| 40 | 80.1 | - | 80.1 |
| 42 | 229.2 | 766.8 | 996.0 |
| 45 | 155.5 | - | 155.5 |
| 46 | 341.4 | - | 341.4 |
| 47 | 683.6 | - | 683.6 |
| 48 | 1,025.8 | 1,566.9 | 2,592.7 |
| 49 | 294.7 | - | 294.7 |
| 50 | 210.2 | - | 210.2 |
| 52 | 620.3 | - | 620.3 |
| 54 | 145.9 | - | 145.9 |
| 56 | 40.6 | - | 40.6 |
| 59 | 2,285.4 | 14,275.1 | 16,560.5 |
| 60 | 392.9 | - | 392.9 |
| 61 | 1,833.3 | 14,255.7 | 16,089.0 |
| TOTALS | 10,689.4 | 31,703.5 | 42,392.9 |

## 4.2 Annual Energy Used

The following table summarizes the baseline energy consumption:

| FUEL | SITE ENERGY MBTU/YR | SOURCE ENERGY MBTU/YR | COST $/YR |
|---|---|---|---|
| Electricity | 24,670 | 24,670* | 216,891+ |
| Natural Gas | 16,887 | 22,629** | 400,037++ |
| Distillate Fuel | 835 | 835 | 3,373 |
| Total | 42,392 | 48,133 | 620,301 |

* Based on ECIP guidance of 25 April 1988 (Purchased Electric Power)

** Based on site energy conversion of 1,000 btu/lb. (TM 5-838-2) and source energy conversion of 1,340 btu/lb. (ECIP guidance)

+ Includes demand charges

## 5.0 ENERGY CONSERVATION ANALYSIS

### 5.1 Energy Conservation Opportunities (ECOs) Investigated

The energy conservation opportunities for each building were identified in the Scope of Work for this project. Thse opportunities are indicated below and were investigated.

Architectural

**Roof/Ceiling Insulation** - Add roof insulation by installing blown-in insulation to improve U-values for the roof/ceiling assembly (Building 42 only).

**Solar Film** - Install solar film on south-facing windows to reduce heat gain and hence air conditioning requirements (Building 42 only).

Mechanical

**Thermal Energy Storage (TES)** - TES or off-peak cooling, relies on a storage medium with high specific heat (e.g., water ice or eutectic salts) to store cooling produced during off-peak hours for utilization during peak hours. Refrigeration is provided by either conventional chillers or by industrial grade ice-making units which charge the storage tanks during off-peak hours. On-peak cooling is provided by circulating chilled liquid from storage through the buildings's air conditioning system or a heat exchanger. (Buildings 59 and 61 only.)

**Dormitory Set-back /Set-up Occupancy Sensors** - Each dormitory room in building 48 is conditioned by a console type water-to-air heat pump unit. This ECO will limit the operating hours of individual room heat pumps by automatically switching the units off when the room is not occupied. Installation of new controls will provide the winter set-back to 63° F and summer set-up to 82° F.

**Office Night Set-back/Set-up (Time Clock)** - Building 48 consists of approximately 65% office space, the remaining being utilized as 2-man dormitory rooms. The office areas occupy all of the basement, first floor, and about half of the second floor.

The office areas are served by a combination of console and ducted closet type water-to-air heat pump units. This ECO will limit the operating hours of the units by floor, automatically switching the units off at a pre-set time. A lo-limit thermostat will prevent the winter temperature from dropping below 55° F.

**Steam Convertor Insulation** - Insulate the steam convertor in the pit in building 59.

**Electrical**

**Replace Standard Fluorescent Lamps with Energy Saving Fluorescent Lamps** - The savings in electrical energy are obtained by removing the existing standard 40 watt fluorescent lamps and replacing them with 34 watt energy saving fluorescent lamps. This allows a reduction in lighting of 6 watts per lamp. The lamp replacement can be achieved under two strategies - spot relamping or group relamping. The lamps are presently being replaced at Fort McNair under a spot relamping strategy, using standard 40 watt fluorescent tubes.

**Replace Standard Fluorescent Ballasts with Energy Efficient Ballasts** - The savings in electrical energy are obtained by removing the existing standard ballasts and replacing them with energy efficient ballasts. By using energy efficient ballasts, the wattage used by a 2-lamp standard ballast type fixture can be reduced by approximately 9 watts.

**Dimming of Fluorescent Lighting** - In those areas where the measured illumination exceeds the footcandle levels indicated in the Army guidelines in accordance with MIL-HDBK-1190, Chapter 9 and with DAEN-ECE-E, Chapter 12, the fluorescent lights can be dimmed. There are two separate strategies that can be used for dimming of the fluorescent lights:

1. Photoelectric Dimming

   With photoelectric dimming, a photocell senses sunlight and compensates by dimming the fluorescent lights.

2. Static Dimming

   Static dimming is applicable in those areas where the lighting levels exceed Army guidelines. The lights would be dimmed to a pre-set level.

**Install Fluorescent Fixture Reflectors** - The existing fluorescent fixtures can be retrofitted with fluorescent fixture reflectors. The fixture reflectors provide additional reflectivity in the fixture so that less light is trapped within the fixture and more light is directed toward the work surfaces. In some instances, the number of light fixtures or lamps can be reduced providing energy savings.

**Replace Incandescent Bulbs with Fluorescent Bulbs** - Although most of the buildings have primarily fluorescent lights, there are some areas where there are some incandescent lamps. These lamps can be replaced with screw in type fluorescent lamps. The energy savings are achieved by the reduction in wattage from 60-100 watts (typical) for the incandescent lamps to approximately 14.5 watts for the fluorescent screw-in lamps.

**Installation of Occupancy Sensors** - Occupancy sensors can be installed in areas where thee may be unnecessary lighting of unused space. The occupancy sensor would detect when an area in unoccupied and, after a pre-determined length of time, would automatically switch the lights off. Conversely, the occupancy sensor would automatically turn on the lights when it detects an occupant in the room. For those rooms where occupancy sensors are being considered, it is estimated that an average of 20% of the time the lights could be turned off.

**Generators** - This ECO evaluates the feasibility of using diesel generators to effectively save electrical demand charges at Fort McNair by reducing the load demand at buildings 59 and 61. There are two possible alternatives that can be considered for using the generators.

Strategy I: Use generators during on-peak hours to reduce electrical demand.

Strategy II: Participate in PEPCO's Curtailable Load Program under rate schedule DC-GT, Rider GT-5.

## 5.2 Recommended ECOs

The results of the analyses of the ECOs for various buildings are categorized into two options. Both options are basically the same with the exception that Option 1 considers lighting ECOs with standard fluorescent lamps while Option 2 considers energy saver lamps. The use of energy saver lamps precludes the use of dimming devices. The ECOs pertaining to dimming are not included in Option 2. Further, energy efficient ballasts have been evaluated using group replacement and spot replacement methods.

The feasibility of each ECO was determined on the basis of energy savings calculations (taking into account synergistic effects), investment cost estimates, and life cycle cost analysis. Savings to investment ratio (SIR) of unity, or greater, for an ECO qualifies it for implementation. The table on the next page lists the recommended ECOs in descending order of savings to investment ratio (SIR) for both options. Option-1 for all buildings is given followed by Option-2 for the same buildings.

# OPTION 1

## BUILDING 31

### LIST OF RECOMMENDED ECO'S

| ECO # | DESCRIPTION | COST (incl. SIOH) $ | FIRST YEAR ANNUAL SAVING$ | ENERGY SAVINGS MBTU/YEAR ELEC | GAS | TOTAL | SIR | SIMPLE PAY-BACK PERIOD YEAR | ANA-LYSIS DATE | PRO-GRAM YEAR | PROG-RAM YEAR COST $ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 31-1 | Replace Incandescent | 123 | 489 | 6 | -3 | 3 | 11.5 | 0.2 | 2/91 | 1993 | 128 |
| 31-2 | Occupancy Sensors | 122 | 40 | 2 | -1 | 1 | 2.4 | 2.8 | 2/91 | 1993 | 127 |
| 31-3 | Static Dimming | 378 | 92 | 6 | -3 | 3 | 1.9 | 3.7 | 2/91 | 1993 | 394 |
| 31-4 | Photoelec. Dimming | 105 | 23 | 2 | -1 | 1 | 1.6 | 4.1 | 2/91 | 1993 | 110 |
| 31-5 | Eff.Ballasts(Group) | 1,737 | 316 | 5 | -3 | 2 | 1.4 | 4.9 | 2/91 | 1993 | 1,812 |
| | Eff.Ballasts (Spot) | 609 | 91 | 5 | -3 | 2 | 1.2 | 6.0 | 2/91 | 1993 | 635 |

**BUILDING 32**

## LIST OF RECOMMENDED ECO'S

| ECO # | DESCRIPTION | COST (incl. SIOH) $ | FIRST YEAR ANNUAL SAVING$ | ENERGY SAVINGS MBTU/YEAR ELEC | GAS | TOTAL | SIR | SIMPLE PAY-BACK PERIOD YEAR | ANA-LYSIS DATE | PRO-GRAM YEAR | PROG-RAM YEAR COST $ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 32-1 | Replace Incandescent | 619 | 2,619 | 42 | -23 | 19 | 12.3 | 0.2 | 2/91 | 1993 | 646 |
| 32-2 | Photoelectric Dimming | 1,728 | 735 | 44 | -25 | 19 | 3.1 | 2.1 | 2/91 | 1993 | 1,802 |
| 32-3 | Static Dimming | 2,708 | 1,035 | 60 | -33 | 27 | 2.9 | 2.4 | 2/91 | 1993 | 2,824 |
| 32-4 | Fixture Reflectors | 7,480 | 2,012 | 119 | -66 | 53 | 2.5 | 3.3 | 2/91 | 1993 | 7,802 |
| 32-5 | Occupancy Sensors | 122 | 32 | 2 | -1 | 1 | 2.0 | 3.4 | 2/91 | 1993 | 127 |
| 32-6 | Eff.Ballasts(Group) | 16,453 | 2,977 | 47 | -26 | 21 | 1.4 | 5.0 | 2/91 | 1993 | 17,160 |
| | Eff.Ballasts (Spot) | 5,768 | 851 | 47 | -26 | 21 | 1.2 | 6.1 | 2/91 | 1993 | 6,016 |

**BUILDING 35**

## LIST OF RECOMMENDED ECO'S

| ECO # | DESCRIPTION | COST (incl. SIOH) $ | FIRST YEAR ANNUAL SAVING$ | ENERGY SAVINGS MBTU/YEAR ELEC | GAS | TOTAL | SIR | SIMPLE PAY-BACK PERIOD YEAR | ANA-LYSIS DATE | PRO-GRAM YEAR | PROG-RAM YEAR COST $ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 35-1 | Replace Incandescent | 564 | 2,837 | 63 | -34 | 29 | 14.5 | 0.2 | 2/91 | 1993 | 588 |
| 35-2 | Occupancy Sensors | 614 | 311 | 18 | -10 | 8 | 3.8 | 1.8 | 2/91 | 1993 | 640 |
| 35-3 | Fixture Reflectors | 2,580 | 693 | 41 | -24 | 17 | 2.5 | 3.4 | 2/91 | 1993 | 2,691 |
| 35-4 | Static Dimming | 2,331 | 637 | 38 | -22 | 16 | 2.1 | 3.3 | 2/91 | 1993 | 2,431 |
| 35-5 | Eff.Ballasts(Group) | 25,036 | 4,419 | 72 | -39 | 33 | 1.4 | 5.2 | 2/91 | 1993 | 26,113 |
| | Eff.Ballasts (Spot) | 8,779 | 1,308 | 72 | -39 | 33 | 1.2 | 6.0 | 2/91 | 1993 | 9,156 |

**BUILDING 39**

## LIST OF RECOMMENDED ECO'S

| ECO # | DESCRIPTION | COST (incl. SIOH) $ | FIRST YEAR ANNUAL SAVING$ | ENERGY SAVINGS MBTU/YEAR ELEC | GAS | TOTAL | SIR | SIMPLE PAY-BACK PERIOD YEAR | ANA-LYSIS DATE | PRO-GRAM YEAR | PROG-RAM YEAR COST $ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 39-1 | Replace Incandescent | 867 | 4,509 | 106 | -56 | 50 | 15.0 | 0.2 | 2/91 | 1993 | 904 |
| 39-2 | Static Dimming | 1,701 | 588 | 34 | -19 | 15 | 2.6 | 2.6 | 2/91 | 1993 | 1,774 |
| 39-3 | Fixture Reflectors | 688 | 186 | 11 | -6 | 5 | 2.5 | 3.3 | 2/91 | 1993 | 718 |
| 39-4 | Occupancy Sensors | 1,106 | 352 | 20 | -11 | 9 | 2.4 | 2.8 | 2/91 | 1993 | 1,154 |
| 39-5 | Eff.Ballasts(Group) | 26,733 | 4,805 | 75 | -41 | 34 | 1.4 | 5.1 | 2/91 | 1993 | 27,883 |
| | Eff.Ballasts (Spot) | 9,168 | 1,363 | 75 | -41 | 34 | 1.2 | 6.1 | 2/91 | 1993 | 9,562 |

**BUILDING 40**

## LIST OF RECOMMENDED ECO'S

| ECO # | DESCRIPTION | COST (incl. SIOH) $ | FIRST YEAR ANNUAL SAVING$ | ENERGY SAVINGS MBTU/YEAR | | | SIR | SIMPLE PAY-BACK PERIOD YEAR | ANA-LYSIS DATE | PRO-GRAM YEAR | PROG-RAM YEAR COST $ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | ELEC | GAS | TOTAL | | | | | |
| 40-1 | Replace Incandescent | 14 | 53 | 1 | 0 | 1 | 9.9 | 0.2 | 2/91 | 1993 | 15 |
| 40-2 | Fixture Reflectors | 429 | 119 | 7 | -4 | 3 | 2.3 | 3.2 | 2/91 | 1993 | 447 |
| 40-3 | Static Dimming | 755 | 241 | 14 | -8 | 6 | 2.2 | 2.8 | 2/91 | 1993 | 787 |
| 40-4 | Occupancy Sensors | 246 | 58 | 3 | -2 | 1 | 1.8 | 3.8 | 2/91 | 1993 | 257 |
| 40-5 | Eff.Ballasts(Group) | 2,991 | 546 | 9 | -5 | 4 | 1.4 | 5.1 | 2/91 | 1993 | 3,120 |
| | Eff.Ballasts(Spot) | 1,049 | 158 | 9 | -5 | 4 | 1.2 | 6.0 | 2/91 | 1993 | 1,094 |

**BUILDING 42**

## LIST OF RECOMMENDED ECO'S

| ECO # | DESCRIPTION | COST (incl. SIOH) $ | FIRST YEAR ANNUAL SAVING$ | ENERGY SAVINGS MBTU/YEAR ELEC | GAS | TOTAL | SIR | SIMPLE PAY-BACK PERIOD YEAR | ANA-LYSIS DATE | PRO-GRAM YEAR | PROG-RAM YEAR COST $ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 42-1 | Replace Incandescent | 110 | 509 | 9 | -2 | 7 | 13.4 | 0.2 | 2/91 | 1993 | 115 |
| 42-2 | Static Dimming | 1,133 | 564 | 29 | - 6 | 23 | 3.8 | 1.8 | 2/91 | 1993 | 1182 |
| 42-3 | Fixture Reflectors | 1204 | 363 | 19 | -4 | 15 | 3.0 | 3.0 | 2/91 | 1993 | 1256 |
| 42-4 | Roof Insulation | 4599 | 568 | 6 | 70 | 76 | 2.3 | 7.3 | 2/91 | 1993 | 4798 |
| 42-5 | Occupancy Sensors | 122 | 28 | 1 | 0 | 1 | 1.9 | 4.0 | 2/91 | 1993 | 127 |
| 42-6 | Eff.Ballasts(Group) | 8298 | 1549 | 24 | -6 | 18 | 1.5 | 4.8 | 2/91 | 1993 | 8655 |
| | Eff.Ballasts(Spot) | 2910 | 483 | 24 | -6 | 18 | 1.3 | 5.4 | 2/91 | 1993 | 3035 |

**BUILDING 45**

## LIST OF RECOMMENDED ECO'S

| ECO # | DESCRIPTION | COST (incl. SIOH) $ | FIRST YEAR ANNUAL SAVING$ | ENERGY SAVINGS MBTU/YEAR | | | SIR | SIMPLE PAY-BACK PERIOD YEAR | ANA-LYSIS DATE | PRO-GRAM YEAR | PROG-RAM YEAR COST $ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | ELEC | GAS | TOTAL | | | | | |
| 45-1 | Replace Incandescent | 317 | 1,249 | 16 | -9 | 7 | 11.4 | 0.2 | 2/91 | 1993 | 331 |
| 45-2 | Fixture Reflectors | 344 | 97 | 6 | -3 | 3 | 2.6 | 3.2 | 2/91 | 1993 | 359 |
| 45-3 | Eff.Ballasts(Group) | 1,206 | 220 | 4 | -2 | 2 | 1.4 | 4.8 | 2/91 | 1993 | 1,258 |
| | Eff.Ballasts(Spot) | 423 | 63 | 4 | -2 | 2 | 1.2 | 6.0 | 2/91 | 1993 | 441 |

**BUILDING 46**

## LIST OF RECOMMENDED ECO'S

| ECO # | DESCRIPTION | COST (incl. SIOH) $ | FIRST YEAR ANNUAL SAVING$ | ENERGY SAVINGS MBTU/YEAR ELEC | GAS | TOTAL | SIR | SIMPLE PAY-BACK PERIOD YEAR | ANA-LYSIS DATE | PRO-GRAM YEAR | PROG-RAM YEAR COST $ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 46-1 | Replace Incandescent | 221 | 937 | 15 | -8 | 7 | 12.3 | 0.2 | 2/91 | 1993 | 231 |
| 46-2 | Fixture Reflectors | 1,977 | 555 | 32 | -17 | 15 | 2.6 | 3.2 | 2/91 | 1993 | 2,062 |
| 46-3 | Static Dimming | 567 | 138 | 8 | -4 | 4 | 1.9 | 3.7 | 2/91 | 1993 | 591 |
| 46-4 | Occupancy Sensors | 246 | 63 | 4 | -2 | 2 | 2.0 | 3.5 | 2/91 | 1993 | 257 |
| 46-5 | Eff.Ballasts(Group) | 12,204 | 2,231 | 36 | -19 | 17 | 1.4 | 4.9 | 2/91 | 1993 | 12,729 |
| | Eff.Ballasts (Spot) | 4,279 | 644 | 36 | -19 | 17 | 1.2 | 6.0 | 2/91 | 1993 | 4,463 |

**BUILDING 47**

## LIST OF RECOMMENDED ECO'S

| ECO # | DESCRIPTION | COST (incl. SIOH) $ | FIRST YEAR ANNUAL SAVING$ | ENERGY SAVINGS MBTU/YEAR ELEC | GAS | TOTAL | SIR | SIMPLE PAY-BACK PERIOD YEAR | ANA-LYSIS DATE | PRO-GRAM YEAR | PROG-RAM YEAR COST $ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 47-1 | Replace Incandescent | 492 | 1,986 | 28 | -15 | 13 | 11.7 | 0.2 | 2/91 | 1993 | 513 |
| 47-2 | Static Dimming | 6,801 | 2,261 | 132 | -73 | 59 | 2.5 | 2.7 | 2/91 | 1993 | 7,093 |
| 47-3 | Occupancy Sensors | 737 | 259 | 15 | -8 | 7 | 2.6 | 2.6 | 2/91 | 1993 | 769 |
| 47-4 | Fixture Reflectors | 257 | 69 | 4 | -2 | 2 | 2.5 | 3.3 | 2/91 | 1993 | 268 |
| 47-5 | Photoelect. Dimming | 366 | 93 | 6 | -3 | 3 | 1.9 | 3.5 | 2/91 | 1993 | 382 |
| 47-6 | Eff.Ballasts(Group) | 23,589 | 4,287 | 68 | -37 | 31 | 1.4 | 5.1 | 2/91 | 1993 | 24,603 |
| | Eff.Ballasts (Spot) | 8,271 | 1,230 | 68 | -37 | 31 | 1.2 | 6.0 | 2/91 | 1993 | 8,627 |

**BUILDING 48**

## LIST OF RECOMMENDED ECO'S

| ECO # | DESCRIPTION | COST (incl. SIOH) $ | FIRST YEAR ANNUAL SAVING$ | ENERGY SAVINGS MBTU/YEAR ELEC | GAS | TOTAL | SIR | SIMPLE PAY-BACK PERIOD YEAR | ANA-LYSIS DATE | PRO-GRAM YEAR | PROG-RAM YEAR COST $ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 48-1 | Replace Incandescent | 737 | 2,840 | 34 | -18 | 16 | 11.2 | 0.2 | 2/91 | 1993 | 769 |
| 48-2 | Static Dimming | 6,108 | 2,203 | 132 | -79 | 53 | 2.7 | 2.5 | 2/91 | 1993 | 6371 |
| 48-3 | Fixture Reflectors | 945 | 303 | 15 | -9 | 6 | 3.0 | 2.8 | 2/91 | 1993 | 986 |
| 48-4 | Photoelec Dimming | 838 | 323 | 20 | -11 | 9 | 2.8 | 2.3 | 2/91 | 1993 | 874 |
| 48-5 | Occupancy Sensors | 1,597 | 523 | 31 | -18 | 13 | 2.5 | 2.7 | 2/91 | 1993 | 1666 |
| 48-6 | Night Setback - Offices | 15,687 | 2,987 | 193 | 114 | 307 | 1.9 | 5.0 | 2/91 | 1993 | 16362 |
| 48-7 | Eff.Ballasts(Group) | 35,552 | 6,418 | 101 | -56 | 45 | 1.4 | 5.1 | 2/91 | 1993 | 37,081 |
| | Eff.Ballasts (Spot) | 12,466 | 1,826 | 101 | -56 | 45 | 1.2 | 6.1 | 2/91 | 1993 | 13,002 |

**BUILDING 49**

## LIST OF RECOMMENDED ECO'S

| ECO # | DESCRIPTION | COST (incl. SIOH) $ | FIRST YEAR ANNUAL SAVING$ | ENERGY SAVINGS MBTU/YEAR ELEC | GAS | TOTAL | SIR | SIMPLE PAY-BACK PERIOD YEAR | ANA-LYSIS DATE | PRO-GRAM YEAR | PROG-RAM YEAR COST $ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 49-1 | Replace Incandescent | 55 | 215 | 3 | -2 | 1 | 11.2 | 0.2 | 2/91 | 1993 | 57 |
| 49-2 | Occupancy Sensors | 122 | 47 | 3 | -2 | 1 | 2.8 | 2.3 | 2/91 | 1993 | 127 |
| 49-3 | Photoelec. Dimming | 314 | 106 | 7 | -5 | 2 | 2.4 | 2.7 | 2/91 | 1993 | 328 |
| 49-4 | Eff.Ballasts(Group) | 1.737 | 293 | 4 | -3 | 1 | 1.3 | 5.4 | 2/91 | 1993 | 1,812 |
| | Eff.Ballasts(Spot) | 609 | 73 | 4 | -3 | 1 | 1.0 | 7.5 | 2/91 | 1993 | 635 |

**BUILDING 50**

## LIST OF RECOMMENDED ECO'S

| ECO # | DESCRIPTION | COST (incl. SIOH) $ | FIRST YEAR ANNUAL SAVING$ | ENERGY SAVINGS MBTU/YEAR ELEC | GAS | TOTAL | SIR | SIMPLE PAY-BACK PERIOD YEAR | ANA-LYSIS DATE | PRO-GRAM YEAR | PROG-RAM YEAR COST $ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 50-1 | Replace Incandescents | 96 | 422 | 7 | -4 | 3 | 12.8 | 0.2 | 2/91 | 1993 | 100 |
| 50-2 | Static Dimming | 314 | 120 | 7 | -4 | 3 | 2.9 | 2.4 | 2/91 | 1993 | 328 |
| 50-3 | Occupancy Sensors | 122 | 24 | 1 | -1 | 0 | 1.6 | 4.6 | 2/91 | 1993 | 127 |
| 50-4 | Photoelec Dimming | 366 | 77 | 5 | -3 | 2 | 1.6 | 4.3 | 2/91 | 1993 | 382 |
| 50-5 | Eff.Ballasts(Group) | 6,946 | 1,262 | 20 | -11 | 9 | 1.4 | 5.1 | 2/91 | 1993 | 7,245 |
| | Ef.Ballasts(Spot) | 2,436 | 362 | 20 | -11 | 9 | 1.2 | 6.0 | 2/91 | 1993 | 2,541 |

**BUILDING 52**

## LIST OF RECOMMENDED ECO'S

| ECO # | DESCRIPTION | COST (incl. SIOH) $ | FIRST YEAR ANNUAL SAVING$ | ENERGY SAVINGS MBTU/YEAR ELEC | GAS | TOTAL | SIR | SIMPLE PAY-BACK PERIOD YEAR | ANA-LYSIS DATE | PRO-GRAM YEAR | PROG-RAM YEAR COST $ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 52-1 | Replace Incandescent | 1,059 | 4,471 | 72 | -39 | 33 | 12.2 | 0.2 | 2/91 | 1993 | 1,105 |
| 52-2 | Occupancy Sensors | 2,950 | 1,015 | 60 | -36 | 24 | 2.6 | 2.6 | 2/91 | 1993 | 3,077 |
| 52-3 | Static Dimming | 2,330 | 510 | 31 | -19 | 12 | 1.7 | 4.1 | 2/91 | 1993 | 2,430 |
| 52-4 | Eff.Ballasts(Group) | 19,634 | 3,541 | 56 | -31 | 25 | 1.4 | 5.1 | 2/91 | 1993 | 20,478 |
| | Eff.Ballasts (spot) | 6,884 | 1,016 | 56 | -31 | 25 | 1.2 | 6.1 | 2/91 | 1993 | 7,180 |

**BUILDING 54**

## LIST OF ECO'S

| ECO # | DESCRIPTION | COST (incl. SIOH) $ | FIRST YEAR ANNUAL SAVING$ | ENERGY SAVINGS MBTU/YEAR ELEC | GAS | TOTAL | SIR | SIMPLE PAY-BACK PERIOD YEAR | ANA-LYSIS DATE | PRO-GRAM YEAR | PROG-RAM YEAR COST $ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 54-1 | Replace Incandescent | 853 | 3,358 | 44 | -23 | 21 | 11.4 | 0.2 | 2/91 | 1993 | 890 |
| 54-2 | Static Dimming | 1,133 | 268 | 16 | -9 | 7 | 1.8 | 3.8 | 2/91 | 1993 | 1,182 |
| 54-3 | Eff.Ballasts(Group) | 3,473 | 632 | 10 | -6 | 4 | 1.4 | 4.9 | 2/91 | 1993 | 3,622 |
| | Eff.Ballasts 9Spot) | 1,217 | 181 | 10 | -6 | 4 | 1.2 | 6.1 | 2/91 | 1993 | 1,269 |

**BUILDING 56**

## LIST OF RECOMMENDED ECO'S

| ECO # | DESCRIPTION | COST (incl. SIOH) $ | FIRST YEAR ANNUAL SAVING$ | ENERGY SAVINGS MBTU/YEAR ELEC | GAS | TOTAL | SIR | SIMPLE PAY-BACK PERIOD YEAR | ANA-LYSIS DATE | PRO-GRAM YEAR | PROG-RAM YEAR COST $ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 56-1 | Replace Incandescent | 27 | 108 | 1 | -1 | 0 | 11.8 | 0.2 | 2/91 | 1993 | 28 |
| 56-2 | Static Dimming | 252 | 95 | 6 | -3 | 3 | 2.8 | 2.4 | 2/91 | 1993 | 263 |
| 56-3 | Fixture Reflectors | 773 | 211 | 12 | -7 | 5 | 2.6 | 3.3 | 2/91 | 1993 | 806 |
| 56-4 | Eff.Ballasts(Group) | 1,448 | 262 | 4 | -2 | 2 | 1.4 | 5.1 | 2/91 | 1993 | 1,510 |
| | Eff.Ballasts (Spot) | 507 | 76 | 4 | -2 | 2 | 1.2 | 6.0 | 2/91 | 1993 | 529 |

**BUILDING 59**

## LIST OF RECOMMENDED ECO'S

| ECO # | DESCRIPTION | COST (incl. SIOH) $ | FIRST YEAR ANNUAL SAVING$ | ENERGY SAVINGS MBTU/YEAR ELEC | GAS | TOTAL | SIR | SIMPLE PAY-BACK PERIOD YEAR | ANA-LYSIS DATE | PRO-GRAM YEAR | PROG-RAM YEAR COST $ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 59-1 | Replace Incandescent | 1,024 | 4,057 | 54 | -30 | 24 | 11.5 | 0.2 | 2/91 | 1993 | 1,068 |
| 59-2 | Steam Conv. Insulation | 570 | 324 | 0 | 48 | 48 | 11.1 | 1.6 | 2/91 | 1993 | 595 |
| 59-3 | Fixture Reflectors | 2,321 | 656 | 40 | -24 | 16 | 2.6 | 3.2 | 2/91 | 1993 | 2,421 |
| 59-4 | Occupancy Sensors | 12,536 | 3,567 | 213 | -130 | 83 | 2.1 | 3.2 | 2/91 | 1993 | 13,075 |
| 59-5 | Static Dimming | 630 | 145 | 9 | -5 | 4 | 1.8 | 3.9 | 2/91 | 1993 | 657 |
| 59-6 | Eff.Ballasts(Group) | 77,520 | 13,870 | 216 | -123 | 93 | 1.4 | 5.1 | 2/91 | 1993 | 80,853 |
| | Eff.Ballasts(Spot) | 27,182 | 3,916 | 216 | -123 | 93 | 1.1 | 6.2 | 2/91 | 1993 | 28,351 |

**BUILDING 60**

## LIST OF RECOMMENDED ECO'S

| ECO # | DESCRIPTION | COST (incl. SIOH) $ | FIRST YEAR ANNUAL SAVING$ | ENERGY SAVINGS MBTU/YEAR ELEC | GAS | TOTAL | SIR | SIMPLE PAY-BACK PERIOD YEAR | ANA-LYSIS DATE | PRO-GRAM YEAR | PROG-RAM YEAR COST $ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 60-1 | Replace Incandescent | 551 | 2,346 | 39 | -21 | 18 | 12.3 | 0.2 | 2/91 | 1993 | 575 |
| 60-2 | Occupancy Sensors | 122 | 38 | 2 | -1 | 1 | 2.4 | 2.9 | 2/91 | 1993 | 127 |
| 60-3 | Static Dimming | 1,385 | 312 | 19 | -11 | 8 | 1.7 | 4.0 | 2/91 | 1993 | 1,445 |
| 60-4 | Eff.Ballasts(Group) | 4,293 | 774 | 12 | -7 | 5 | 1.4 | 5.1 | 2/91 | 1993 | 4,478 |
| | Eff.Ballasts(Spot) | 1,505 | 220 | 12 | -7 | 5 | 1.2 | 6.2 | 2/91 | 1993 | 1,570 |

**BUILDING 61**

## LIST OF RECOMMENDED ECO'S

| ECO # | DESCRIPTION | COST (incl. SIOH) $ | FIRST YEAR ANNUAL SAVING$ | ENERGY SAVINGS MBTU/YEAR ELEC | GAS | TOTAL | SIR | SIMPLE PAY-BACK PERIOD YEAR | ANA-LYSIS DATE | PRO-GRAM YEAR | PROG-RAM YEAR COST $ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 61-1 | Replace Incandescent | 1,298 | 5,293 | 77 | -42 | 35 | 11.8 | 0.2 | 2/91 | 1993 | 1,354 |
| 61-2 | Occupancy Sensors | 3,810 | 1,469 | 87 | -53 | 34 | 2.9 | 2.3 | 2/91 | 1993 | 3,974 |
| 61-3 | Static Dimming | 3,967 | 1,263 | 76 | -46 | 30 | 2.4 | 2.8 | 2/91 | 1993 | 4,138 |
| 61-4 | Eff.Ballasts(Group) | 60,637 | 10,857 | 169 | -96 | 73 | 1.4 | 5.1 | 2/91 | 1993 | 63,244 |
| | Eff.Ballasts(Spot) | 21,261 | 3,066 | 169 | -96 | 73 | 1.2 | 6.2 | 2/91 | 1993 | 22,175 |

# OPTION 2

## BUILDING 31

### LIST OF RECOMMENDED ECO'S

| ECO # | DESCRIPTION | COST (incl. SIOH) $ | FIRST YEAR ANNUAL SAVING$ | ENERGY SAVINGS MBTU/YEAR ELEC | GAS | TOTAL | SIR | SIMPLE PAY-BACK PERIOD YEAR | ANA-LYSIS DATE | PRO-GRAM YEAR | PROG-RAM YEAR COST $ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 31-1 | Replace Incandescent | 123 | 489 | 6 | -3 | 3 | 11.5 | 0.2 | 2/91 | 1993 | 128 |
| 31-2 | Occupancy Sensors | 122 | 38 | 2 | -1 | 1 | 2.4 | 2.9 | 2/91 | 1993 | 127 |
| 31-3 | Energy Saver Lamps | 532 | 358 | 7 | -4 | 3 | 1.9 | 1.3 | 2/91 | 1993 | 555 |
| 31-4 | Eff.Ballasts(Group) | 1,737 | 316 | 5 | -3 | 2 | 1.4 | 4.9 | 2/91 | 1993 | 1,812 |

**BUILDING 32**

## LIST OF RECOMMENDED ECO'S

| ECO # | DESCRIPTION | COST (incl. SIOH) $ | FIRST YEAR ANNUAL SAVING$ | ENERGY SAVINGS MBTU/YEAR ELEC | GAS | TOTAL | SIR | SIMPLE PAY-BACK PERIOD YEAR | ANA-LYSIS DATE | PRO-GRAM YEAR | PROG-RAM YEAR COST $ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 32-1 | Replace Incandescent | 619 | 2,619 | 42 | -23 | 19 | 12.3 | 0.2 | 2/91 | 1993 | 646 |
| 32-2 | Energy Saver Lamps | 4,818 | 3,136 | 60 | -33 | 27 | 2.9 | 1.4 | 2/91 | 1993 | 5,025 |
| 32-3 | Fixture Reflectors | 8,253 | 1,790 | 107 | -59 | 48 | 2.0 | 4.1 | 2/91 | 1993 | 8,608 |
| 32-4 | Occupancy Sensors | 614 | 149 | 9 | -5 | 4 | 1.9 | 3.7 | 2/91 | 1993 | 640 |
| 32-5 | Eff.Ballasts(Group) | 16,453 | 2,977 | 47 | -26 | 21 | 1.4 | 5.0 | 2/91 | 1993 | 17,160 |

**BUILDING 35**

## LIST OF RECOMMENDED ECO'S

| ECO # | DESCRIPTION | COST (incl. SIOH) $ | FIRST YEAR ANNUAL SAVING$ | ENERGY SAVINGS MBTU/YEAR | | | SIR | SIMPLE PAY-BACK PERIOD YEAR | ANA-LYSIS DATE | PRO-GRAM YEAR | PROG-RAM YEAR COST $ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | ELEC | GAS | TOTAL | | | | | |
| 35-1 | Replace Incandescent | 564 | 2,837 | 63 | -34 | 29 | 14.5 | 0.2 | 2/91 | 1993 | 588 |
| 35-2 | Occupancy Sensors | 860 | 352 | 20 | -11 | 9 | 3.1 | 2.2 | 2/91 | 1993 | 897 |
| 35-3 | Energy Saver Lamps | 6,641 | 4,341 | 83 | -46 | 37 | 3.0 | 1.4 | 2/91 | 1993 | 6,927 |
| 35-4 | Fixture Reflectors | 2,751 | 605 | 36 | -20 | 16 | 2.1 | 4.1 | 2/91 | 1993 | 2,869 |
| 35-5 | Eff.Ballasts(Group) | 25,036 | 4,419 | 72 | -39 | 33 | 1.4 | 5.1 | 2/91 | 1993 | 26,113 |

**BUILDING 39**

## LIST OF RECOMMENDED ECO'S

| ECO # | DESCRIPTION | COST (incl. SIOH) $ | FIRST YEAR ANNUAL SAVING$ | ENERGY SAVINGS MBTU/YEAR ELEC | GAS | TOTAL | SIR | SIMPLE PAY-BACK PERIOD YEAR | ANA-LYSIS DATE | PRO-GRAM YEAR | PROG-RAM YEAR COST $ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 39-1 | Replace Incandescent | 867 | 4,509 | 106 | -56 | 50 | 15.0 | 0.2 | 2/91 | 1993 | 904 |
| 39-2 | Energy Saver Lamps | 7,534 | 4,925 | 95 | -52 | 43 | 3.0 | 1.4 | 2/91 | 1993 | 7,858 |
| 39-3 | Fixture Reflectors | 688 | 150 | 9 | -5 | 4 | 2.1 | 4.1 | 2/91 | 1993 | 718 |
| 39-4 | Occupancy Sensors | 1,351 | 341 | 20 | -11 | 9 | 1.9 | 3.6 | 2/91 | 1993 | 1,409 |
| 39-5 | Eff.Ballasts(Group) | 26,733 | 4,805 | 75 | -41 | 34 | 1.4 | 5.0 | 2/91 | 1993 | 27,883 |

**BUILDING 40**

## LIST OF RECOMMENDED ECO'S

| ECO # | DESCRIPTION | COST (incl. SIOH) $ | FIRST YEAR ANNUAL SAVING$ | ENERGY SAVINGS MBTU/YEAR | | | SIR | SIMPLE PAY-BACK PERIOD YEAR | ANA-LYSIS DATE | PRO-GRAM YEAR | PROG-RAM YEAR COST $ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | ELEC | GAS | TOTAL | | | | | |
| 40-1 | Replace Incandescent | 14 | 53 | 1 | 0 | 1 | 11.0 | 0.2 | 2/91 | 1993 | 15 |
| 40-2 | Energy Saver Lamps | 767 | 504 | 10 | -5 | 5 | 3.0 | 1.4 | 2/91 | 1993 | 800 |
| 40-3 | Occupancy Sensors | 246 | 75 | 3 | -2 | 1 | 2.4 | 2.9 | 2/91 | 1993 | 257 |
| 40-4 | Fixture Reflectors | 429 | 96 | 6 | -3 | 3 | 2.1 | 4.0 | 2/91 | 1993 | 447 |
| 40-5 | Eff.Ballasts(Group) | 2,991 | 546 | 9 | -5 | 4 | 1.3 | 4.9 | 2/91 | 1993 | 3120 |

**BUILDING 42**

## LIST OF RECOMMENDED ECO'S

| ECO # | DESCRIPTION | COST (incl. SIOH) $ | FIRST YEAR ANNUAL SAVING$ | ENERGY SAVINGS MBTU/YEAR | | | SIR | SIMPLE PAY-BACK PERIOD YEAR | ANA-LYSIS DATE | PRO-GRAM YEAR | PROG-RAM YEAR COST $ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | ELEC | GAS | TOTAL | | | | | |
| 42-1 | Replace Incandescent | 110 | 509 | 9 | -2 | 7 | 13.4 | 0.2 | 2/91 | 1993 | 115 |
| 42-2 | Energy Saver Lamps | 2,538 | 1,648 | 31 | -18 | 13 | 2.9 | 1.4 | 2/91 | 1993 | 2,647 |
| 42-3 | Roof Insulation | 4,599 | 568 | 6 | 70 | 76 | 2.3 | 7.3 | 2/91 | 1993 | 4,798 |
| 42-4 | Fixture Reflectors | 1,805 | 388 | 23 | -13 | 10 | 2.0 | 4.2 | 2/91 | 1993 | 1,883 |
| 42-5 | Occupancy Sensors | 122 | 22 | 1 | -1 | 0 | 1.4 | 5.0 | 2/91 | 1993 | 127 |
| 42-6 | Eff.Ballasts(Group) | 8,298 | 1,549 | 24 | -6 | 18 | 1.5 | 4.8 | 2/91 | 1993 | 8,655 |

**BUILDING 45**

## LIST OF RECOMMENDED ECO'S

| ECO # | DESCRIPTION | COST (incl. SIOH) $ | FIRST YEAR ANNUAL SAVING$ | ENERGY SAVINGS MBTU/YEAR ELEC | GAS | TOTAL | SIR | SIMPLE PAY-BACK PERIOD YEAR | ANA-LYSIS DATE | PRO-GRAM YEAR | PROG-RAM YEAR COST $ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 45-1 | Replace Incandescent | 317 | 1,249 | 16 | -9 | 7 | 11.4 | 0.2 | 2/91 | 1993 | 331 |
| 45-2 | Energy Saver Lamps | 362 | 239 | 5 | -3 | 2 | 3.0 | 1.4 | 2/91 | 1993 | 378 |
| 45-3 | Fixture Reflectors | 344 | 78 | 5 | -3 | 2 | 2.1 | 4.0 | 2/91 | 1993 | 359 |
| 45-4 | Eff.Ballasts(Group) | 1,206 | 220 | 4 | -2 | 2 | 1.4 | 4.8 | 2/91 | 1993 | 1,258 |

**BUILDING 46**

## LIST OF RECOMMENDED ECO'S

| ECO # | DESCRIPTION | COST (incl. SIOH) $ | FIRST YEAR ANNUAL SAVING$ | ENERGY SAVINGS MBTU/YEAR | | | SIR | SIMPLE PAY-BACK PERIOD YEAR | ANA-LYSIS DATE | PRO-GRAM YEAR | PROG-RAM YEAR COST $ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | ELEC | GAS | TOTAL | | | | | |
| 46-1 | Replace Incandescent | 221 | 937 | 15 | -8 | 7 | 12.3 | 0.2 | 2/91 | 1993 | 229 |
| 46-2 | Energy Saver Lamps | 3,041 | 2,005 | 39 | -21 | 18 | 3.0 | 1.4 | 2/91 | 1993 | 3,172 |
| 46-3 | Fixture Reflectors | 1,997 | 447 | 26 | -14 | 12 | 2.1 | 4.0 | 2/91 | 1993 | 2,062 |
| 46-4 | Occupancy Sensors | 246 | 53 | 3 | -2 | 1 | 1.7 | 4.2 | 2/91 | 1993 | 257 |
| 46-5 | Eff.Ballasts(Group) | 12,220 | 2,231 | 36 | -19 | 17 | 1.4 | 4.9 | 2/91 | 1993 | 12,729 |

**BUILDING 47**

## LIST OF RECOMMENDED ECO'S

| ECO # | DESCRIPTION | COST (incl. SIOH) $ | FIRST YEAR ANNUAL SAVING$ | ENERGY SAVINGS MBTU/YEAR | | | SIR | SIMPLE PAY-BACK PERIOD YEAR | ANA-LYSIS DATE | PRO-GRAM YEAR | PROG-RAM YEAR COST $ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | ELEC | GAS | TOTAL | | | | | |
| 47-1 | Replace Incandescent | 492 | 1,986 | 28 | -15 | 13 | 11.7 | 0.2 | 2/91 | 1993 | 513 |
| 47-2 | Energy Saver Lamps | 7,217 | 4,718 | 91 | -50 | 41 | 3.0 | 1.4 | 2/91 | 1993 | 7,527 |
| 47-3 | Occupancy Sensors | 737 | 220 | 13 | -7 | 6 | 2.3 | 3.0 | 2/91 | 1993 | 769 |
| 47-4 | Fixture Reflectors | 860 | 189 | 11 | -6 | 5 | 2.1 | 4.1 | 2/91 | 1993 | 897 |
| 47-5 | Eff.Ballasts(Group) | 23,589 | 4,287 | 68 | -37 | 31 | 1.4 | 5.0 | 2/91 | 1993 | 24,603 |

**BUILDING 48**

## LIST OF RECOMMENDED ECO'S

| ECO # | DESCRIPTION | COST (incl. SIOH) $ | FIRST YEAR ANNUAL SAVING$ | ENERGY SAVINGS MBTU/YEAR | | | SIR | SIMPLE PAY-BACK PERIOD YEAR | ANA-LYSIS DATE | PRO-GRAM YEAR | PROG-RAM YEAR COST $ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | ELEC | GAS | TOTAL | | | | | |
| 48-1 | Replace Incandescent | 737 | 2,840 | 34 | -18 | 16 | 11.2 | 0.2 | 2/91 | 1993 | 769 |
| 48-2 | Energy Saver Lamps | 10,552 | 6,839 | 130 | -73 | 57 | 2.9 | 1.4 | 2/91 | 1993 | 11,006 |
| 48-3 | Occupancy Sensors | 1,843 | 538 | 31 | -18 | 13 | 2.2 | 3.1 | 2/91 | 1993 | 1,922 |
| 48-4 | Fixture Reflectors | 945 | 203 | 12 | -7 | 5 | 2.0 | 4.2 | 2/91 | 1993 | 986 |
| 48-5 | Night Setback - Offices | 15,687 | 2,987 | 193 | 114 | 307 | 1.9 | 5.0 | 2/91 | 1993 | 16362 |
| 48-6 | Eff.Ballasts(Group) | 35,552 | 6,418 | 101 | -56 | 45 | 1.4 | 5.0 | 2/91 | 1993 | 37,081 |

**BUILDING 49**

## LIST OF RECOMMENDED ECO'S

| ECO # | DESCRIPTION | COST (incl. SIOH) $ | FIRST YEAR ANNUAL SAVING$ | ENERGY SAVINGS MBTU/YEAR | | | SIR | SIMPLE PAY-BACK PERIOD YEAR | ANA-LYSIS DATE | PRO-GRAM YEAR | PROG-RAM YEAR COST $ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | ELEC | GAS | TOTAL | | | | | |
| 49-1 | Replace Incandescent | 55 | 215 | 3 | -2 | 1 | 11.3 | 0.2 | 2/91 | 1993 | 57 |
| 49-2 | Energy Saver Lamps | 532 | 326 | 6 | -4 | 2 | 2.8 | 1.5 | 2/91 | 1993 | 555 |
| 49-3 | Occupancy Sensors | 122 | 30 | 2 | -2 | 0 | 1.8 | 3.7 | 2/91 | 1993 | 127 |
| 49-4 | Fixture Reflectors | 257 | 45 | 3 | -2 | 1 | 1.6 | 5.1 | 2/91 | 1993 | 268 |
| 49-5 | Eff.Ballasts(Group) | 1,737 | 293 | 4 | -3 | 1 | 1.3 | 5.3 | 2/91 | 1993 | 1,812 |

**BUILDING 50**

## LIST OF RECOMMENDED ECO'S

| ECO # | DESCRIPTION | COST (incl. SIOH) $ | FIRST YEAR ANNUAL SAVING$ | ENERGY SAVINGS MBTU/YEAR ELEC | GAS | TOTAL | SIR | SIMPLE PAY-BACK PERIOD YEAR | ANA-LYSIS DATE | PRO-GRAM YEAR | PROG-RAM YEAR COST $ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 50-1 | Replace Incandescents | 96 | 422 | 7 | -4 | 3 | 12.8 | 0.2 | 2/91 | 1993 | 100 |
| 50-2 | Energy Saver Lamps | 2,125 | 1,388 | 27 | -15 | 12 | 2.9 | 1.4 | 2/91 | 1993 | 2,216 |
| 50-4 | Eff.Ballasts(Group) | 6,946 | 1,262 | 20 | -11 | 9 | 1.4 | 5.0 | 2/91 | 1993 | 7,245 |

**BUILDING 52**

## LIST OF RECOMMENDED ECO'S

| ECO # | DESCRIPTION | COST (incl. SIOH) $ | FIRST YEAR ANNUAL SAVING$ | ENERGY SAVINGS MBTU/YEAR ELEC | GAS | TOTAL | SIR | SIMPLE PAY-BACK PERIOD YEAR | ANA-LYSIS DATE | PRO-GRAM YEAR | PROG-RAM YEAR COST $ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 52-1 | Replace Incandescent | 1,059 | 4,471 | 72 | -39 | 33 | 12.2 | 0.2 | 2/91 | 1993 | 1,105 |
| 52-2 | Energy saver Lamps | 3,689 | 2,395 | 46 | -25 | 21 | 2.9 | 1.4 | 2/91 | 1993 | 3,848 |
| 52-3 | Occupancy Sensors | 2,704 | 843 | 49 | -27 | 22 | 2.4 | 2.9 | 2/91 | 1993 | 2,820 |
| 52-4 | Eff.Ballasts(Group) | 19,634 | 3,541 | 56 | -31 | 25 | 1.4 | 5.0 | 2/91 | 1993 | 20,748 |

**BUILDING 54**

## LIST OF RECOMMENDED ECO'S

| ECO # | DESCRIPTION | COST (incl. SIOH) $ | FIRST YEAR ANNUAL SAVING$ | ENERGY SAVINGS MBTU/YEAR | | | SIR | SIMPLE PAY-BACK PERIOD YEAR | ANA-LYSIS DATE | PRO-GRAM YEAR | PROG-RAM YEAR COST $ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | ELEC | GAS | TOTAL | | | | | |
| 54-1 | Replace Incandescent | 853 | 3,358 | 44 | -23 | 21 | 11.4 | 0.2 | 2/91 | 1993 | 890 |
| 54-2 | Energy Saver Lamps | 192 | 125 | 2 | -1 | 1 | 2.9 | 1.4 | 2/91 | 1993 | 200 |
| 54-3 | Eff.Ballasts(Group) | 3,473 | 632 | 10 | -6 | 4 | 1.4 | 4.9 | 2/91 | 1993 | 3,662 |

**BUILDING 56**

## LIST OF RECOMMENDED ECO'S

| ECO # | DESCRIPTION | COST (incl. SIOH) $ | FIRST YEAR ANNUAL SAVING$ | ENERGY SAVINGS MBTU/YEAR | | | SIR | SIMPLE PAY-BACK PERIOD YEAR | ANA-LYSIS DATE | PRO-GRAM YEAR | PROG-RAM YEAR COST $ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | ELEC | GAS | TOTAL | | | | | |
| 56-1 | Replace Incandescent | 27 | 108 | 1 | -1 | 0 | 11.6 | 0.2 | 2/91 | 1993 | 28 |
| 56-2 | Energy Saver Lamps | 443 | 290 | 6 | -3 | 3 | 3.0 | 1.4 | 2/91 | 1993 | 462 |
| 56-3 | Fixture Reflectors | 773 | 170 | 10 | -6 | 4 | 2.1 | 4.1 | 2/91 | 1993 | 806 |
| 56-4 | Eff.Ballasts(Group) | 1,448 | 262 | 4 | -2 | 2 | 1.4 | 5.0 | 2/91 | 1993 | 1,510 |

**BUILDING 59**

## LIST OF RECOMMENDED ECO'S

| ECO # | DESCRIPTION | COST (incl. SIOH) $ | FIRST YEAR ANNUAL SAVING$ | ENERGY SAVINGS MBTU/YEAR | | | SIR | SIMPLE PAY-BACK PERIOD YEAR | ANA-LYSIS DATE | PRO-GRAM YEAR | PROG-RAM YEAR COST $ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | ELEC | GAS | TOTAL | | | | | |
| 59-1 | Replace Incandescent | 1,024 | 4,057 | 54 | -30 | 24 | 11.5 | 0.2 | 2/91 | 1993 | 1,068 |
| 59-2 | Steam Conv. Insulation | 570 | 324 | 0 | 48 | 48 | 11.1 | 1.6 | 2/91 | 1993 | 595 |
| 59-3 | Energy saver Lamps | 20,249 | 13,066 | 249 | -142 | 107 | 2.9 | 1.4 | 2/91 | 1993 | 21,120 |
| 59-4 | Occupancy Sensors | 12,536 | 3,773 | 222 | -127 | 95 | 2.3 | 3.0 | 2/91 | 1993 | 13,075 |
| 59-5 | Fixture Reflectors | 2,493 | 543 | 33 | -19 | 14 | 2.0 | 4.1 | 2/91 | 1993 | 2,600 |
| 59-6 | Eff.Ballasts(Group) | 77,520 | 13,870 | 216 | -123 | 93 | 1.4 | 5.0 | 2/91 | 1993 | 80,853 |

**BUILDING 60**

## LIST OF RECOMMENDED ECO'S

| ECO # | DESCRIPTION | COST (incl. SIOH) $ | FIRST YEAR ANNUAL SAVING$ | ENERGY SAVINGS MBTU/YEAR ELEC | GAS | TOTAL | SIR | SIMPLE PAY-BACK PERIOD YEAR | ANA-LYSIS DATE | PRO-GRAM YEAR | PROG-RAM YEAR COST $ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 60-1 | Replace Incandescent | 551 | 2,346 | 39 | -21 | 18 | 12.3 | 0.2 | 2/91 | 1993 | 575 |
| 60-2 | Energy Saver Lamps | 664 | 431 | 8 | -5 | 3 | 2.9 | 1.4 | 2/91 | 1993 | 693 |
| 60-3 | Occupancy Sensors | 122 | 31 | 2 | -1 | 1 | 1.9 | 3.5 | 2/91 | 1993 | 127 |
| 60-4 | Eff.Ballasts(Group) | 4,293 | 774 | 12 | -7 | 5 | 1.4 | 5.0 | 2/91 | 1993 | 4,478 |

**BUILDING 61**

## LIST OF RECOMMENDED ECO'S

| ECO # | DESCRIPTION | COST (incl. SIOH) $ | FIRST YEAR ANNUAL SAVING$ | ENERGY SAVINGS MBTU/YEAR | | | SIR | SIMPLE PAY-BACK PERIOD YEAR | ANA-LYSIS DATE | PRO-GRAM YEAR | PROG-RAM YEAR COST $ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | ELEC | GAS | TOTAL | | | | | |
| 61-1 | Replace Incandescent | 1,298 | 5,293 | 77 | -42 | 35 | 11.8 | 0.2 | 2/91 | 1993 | 1,354 |
| 61-2 | Energy Saver Lamps | 14,714 | 9,451 | 178 | -101 | 77 | 2.9 | 1.4 | 2/91 | 1993 | 15,347 |
| 61-3 | Occupancy Sensors | 3,072 | 1,086 | 64 | -36 | 28 | 2.7 | 2.5 | 2/91 | 1993 | 3,204 |
| 61-4 | Eff.Ballasts(Group) | 60,637 | 10,857 | 169 | -96 | 73 | 1.4 | 5.0 | 2/91 | 1993 | 63,244 |

## 6.0 ENERGY AND COST SAVINGS

The following table presents the estimated energy usage patterns and costs before and after the implementation of the recommended ECOs.

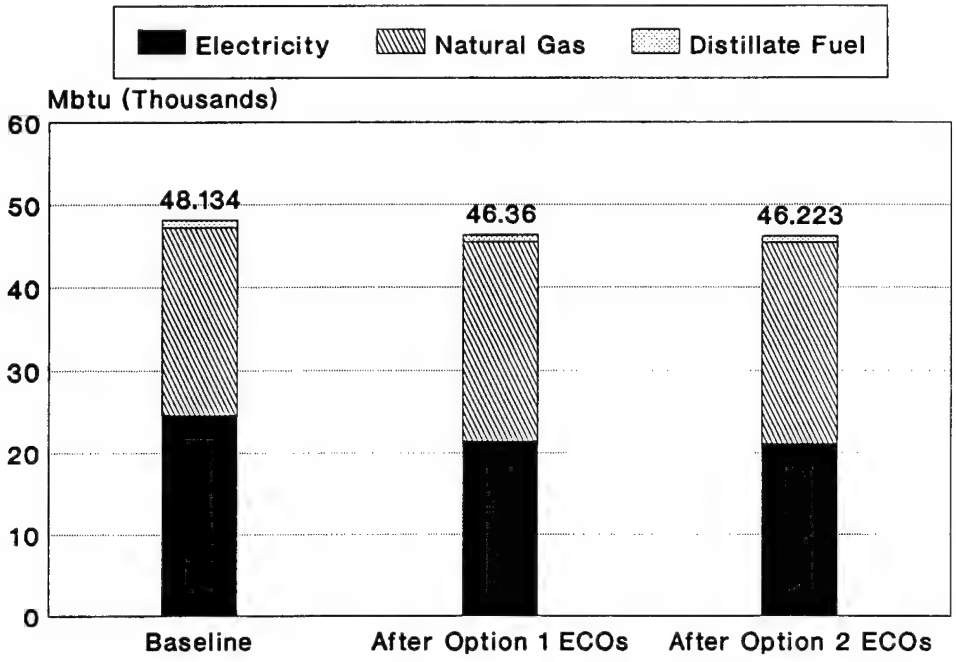
**OPTION 1**

| | Existing Energy & Cost | Energy and Cost After Implementation of ECOs | Savings After Implementation | |
|---|---|---|---|---|
| | | | % | Savings |
| Source Energy Consumption | | | | |
| Electricity MBtu | 24,670 | 21,457 | 13.0 | 3,213 |
| Natural Gas MBtu | 22,629 | 24,076 | (6.4) | (1,447) |
| Distillate Oil Mbtu | 835 | 835 | 0 | 0 |
| Total Mbtu | 48,134 | 46,368 | 3.7 | 1,766 |
| Site Energy Consumption Total MBtu | 42,392 | 40,187 | 5.2 | 2,432 |
| Energy Costs | | | | |
| Per/year | $620,301 | $579,361 | 6.6 | $40,940 |

**OPTION 2**

| | Existing Energy & Cost | Energy and Cost After Implementation of ECOs | Savings After Implementation | |
|---|---|---|---|---|
| | | | % | Savings |
| Source Energy Consumption | | | | |
| Electricity MBtu | 24,670 | 21,128 | 14.3 | 3,542 |
| Natural Gas MBtu | 22,629 | 24,260 | (7.2) | (1,631) |
| Distillate Oil | 835 | 835 | 0 | 0 |
| Total MBtu | 48,134 | 46,223 | 4.0 | 1,911 |
| Site Energy Consumption Total MBtu | 42,392 | 40,061 | 5.5 | 2,610 |
| Energy Costs | | | | |
| Per/year | $620,301 | $556,894 | 10.3 | $63,812 |

# Energy Usage By Fuel



## 7.0 ENERGY PLAN

The following categories of programs are available for the recommended ECOs:
Energy Conservation Investment Program (ECIP); This program is for projects which have a construction cost estimate greater than $200,000, a savings to investment ratio (SIR) greater than one and a simple payback period of ten years or less.
Productivity Capital Investment Programs (PCIP): The projects that do not qualify for ECIP fall into the category of Productivity Capital Investment Programs (PCIP). The following categories of PCIP programs are available for the recommended ECOs:

1. Quick Return in Investment Program (QRIP): This program is for projects which have a total cost of less than $100,000 and a simple payback period of two years or less. Three year procurement (AMMO and OPA) appropriations are available for this program.

2. Productivity Enhancing Capital Investment Program (PECIP). This program is for projects which have a cost greater that $100,000 and a simple payback period of four years or less. Projects under this program must be pre-identified two fiscal years in advance.

3. OSD Productivity Investment Funding (OSD PIF). This program is for projects which have a cost greater that $100,000 and simple payback period of four years or less. The projects under this program require MCA funding. Because of the difficulty in obtaining MCA funding, implementation under this program has not been considered.

Considering the availability of the above programs, the following packages have been prepared for each option.

## OPTION 1

1. ECIP - Following projects will qualify under this program. Completion of DD Form 1391c and supporting data will be required.

| ECO DESCRIPTION | BUILDING NO. | COST (INCL. SIOH) FY 1991 | Program Year 1993 |
|---|---|---|---|
| Replace incandescent lamps w/fluorescent | 31, 32, 35, 39, 40, 42, 45, 46, 47, 48, 49, 50, 52, 54, 56, 59, 60, and 61 | $ 9,054 | $ 9,443 |
| Static Dimmers | 31, 32, 35, 39, 40, 42, 46, 47, 48, 50, 52, 54, 56, 59, 60, and 61 | $ 32,494 | $33,891 |
| Photo-Electric Dimmers | 31, 32, 47, 48, 49, and 50 | $ 3,682 | $ 3,841 |
| Fixture Reflectors | 32, 35, 39, 40, 42, 45, 46, 47, 48, 56, and 59 | $ 19,001 | $19,818 |
| Occupancy Sensors | 31, 32, 35, 39, 40, 42, 46, 47, 48, 49 50, 52, 60, 59 and 61 | $ 24,574 | $25,631 |
| Energy-Efficient Ballasts (Spot Replacement) | 31, 32, 35, 39, 40, 42, 45, 46, 47, 48, 49, 50, 52, 54, 56, 59, 60, and 61 | $115,321 | $120,280 |
| Roof Insulation | 42 | $ 4,599 | $ 4,797 |
| Night Setback | 48 | $ 15,687 | $ 16,362 |
| Steam Convertor Insulation | 59 | $ 570 | $ 594 |
| TOTAL | | $224,982 | $234,657 |

2. QRIP - Following projects will qualify under this program. Completion of Form 5108-1-R and supporting data will be required.

| ECO DESCRIPTION | BUILDING NO. | FY 1991 | COST (INCL. SIOH) Program Year 1993 |
|---|---|---|---|
| Replace incandescent lamps w/fluorescent | 31, 32, 35, 39, 40, 42, 45, 46, 47, 48, 49, 50, 52, 54, 56, 59, 60 and 61 | $ 9,054 | $ 9,443 |
| Static Dimmers | 31, 32, 35, 39, 40, 42, 46, 47, 48, 50, 52, 54, 56, 59, 60, and 61 | $32,494 | $33,891 |
| Photo-Electric Dimmers | 31, 32, 47, 48, 49, and 50 | $ 3,682 | $ 3,841 |
| Fixture Reflectors | 32, 35, 39, 40, 42, 45, 46, 47, 48, 56 and 59 | $19,001 | $19,818 |
| Occupancy Sensors | 31, 32, 35, 39, 40, 42, 46, 47, 48, 49 50, 52, 59, 60 and 61 | $24,574 | $25,631 |
| Roof Insulation | 42 | $ 4,599 | $4,797 |
| Steam Convertor Insulation | 59 | $ 570 | $594 |
| TOTAL | | $93,974 | $98,015 |

3. **PECIP**: All recommended ECOs would qualify under this program. Completion of Form 5108-1-R and supporting data will be required. The project must be identified two fiscal years in advance. Following is a summary of the ECOs in various buildings:

| ECO DESCRIPTION | BUILDING NO. | COST (INCL. SIOH) FY 1991 | Program Year 1993 |
|---|---|---|---|
| Replace incandescent lamps w/fluorescent | 31, 32, 35, 39, 40, 42, 45, 46, 47, 48, 49, 50, 52, 54, 56, 59, 60, and 61 | $ 9,054 | $ 9,443 |
| Static Dimmers | 31, 32, 35, 39, 40, 42, 46, 47, 48, 50, 52, 54, 56, 59, 60, and 61 | $ 32,494 | $33,891 |
| Photo-Electric Dimmers | 31, 32, 47, 48, 49, and 50 | $ 3,682 | $ 3,841 |
| Fixture Reflectors | 32, 35, 39, 40, 42, 45, 46, 47, 48, 56, and 59 | $ 19,001 | $19,818 |
| Occupancy Sensors | 31, 32, 35, 39, 40, 42, 46, 47, 48, 49 50, 52, 60, 59 and 61 | $ 24,574 | $25,631 |
| Energy-Efficient Ballasts (Group Replacement) | 31, 32, 35, 39, 40, 42, 45, 46, 47, 48, 49, 50, 52, 54, 56, 59, 60, and 61 | $328,895 | $343,037 |
| Roof Insulation | 42 | $ 4,599 | $ 4,797 |
| Night Setback | 48 | $ 15,687 | $ 16,362 |
| Steam Convertor Insulation | 59 | $ 570 | $ 594 |
| TOTAL | | $438,556 | $457,414 |

## OPTION 2

1. **PECIP**: All recommended ECOs would qualify under this program. Completion of Form 5108-1-R and supporting data will be required. The project must be identified two fiscal years in advance. Following is a summary of the ECOs in various buildings:

| ECO DESCRIPTION | BUILDING NO. | COST (INCL. SIOH) FY 1991 | Program Year 1993 |
|---|---|---|---|
| Replace incandescent lamps w/fluorescent | 31, 32, 35, 39, 40, 42, 45, 46, 47, 48, 49, 50, 52, 54, 56, 59, 60, and 61 | $ 9,054 | $ 9,443 |
| Energy Saver Lamps | 31, 32, 35, 39, 40, 42, 45, 46, 47, 48, 49, 50, 52, 54, 56, 59, 60, and 61 | $86,609 | $90,333 |
| Fixture Reflectors | 32, 35, 39, 40, 42, 45, 46, 47, 48, 49, 56, and 59 | $21,580 | $22,508 |
| Occupancy Sensors | 31, 32, 35, 39, 40, 42, 46, 47, 48, 49 50, 52, 60, and 61 | $24,699 | $25,761 |
| Energy-Efficient Ballasts (Group Replacement) | 31, 32, 35, 39, 40, 42, 45, 46, 47, 48, 49, 50, 52, 54, 56, 59, 60, and 61 | $328,895 | $343,037 |
| Roof Insulation | 42 | $ 4,599 | $4,797 |
| Night Setback | 48 | $ 15,687 | $ 16,362 |
| Steam Convertor Insulation | 59 | $ 570 | $594 |
| TOTAL | | $491,693 | $512,835 |

## 8.0 MAINTENANCE AND REPAIR

Generally, all the buildings surveyed appear to have a good level of maintenance. In addition, the equipment and the equipment rooms are neat and clean, which in itself is a sign of good maintenance. Some items that require corrective action are described in the narrative for each building. Major maintenance, repair and operational items are:

1. Check the indoor and outdoor reset for the various buildings and set the system in operation with proper reset schedules.

2. Set night setback controls in proper operation after checking and repairing them.

3. Evaluate the outside air requirements in various buildings and set the dampers to provide new levels of outside air.

The implementation of these measures will have a major effect on energy usage by resulting in a reduced energy budget for the post.